It thus appears that the recent more exact determinations have raised what was probable when I wrote my memoir into being now almost certain, by showing with greatly increased clearness—

(1) That argon is unable to escape from the earth.

(2) That helium is slowly escaping, and presumably was in a position to escape more freely in the distant past.

It is interesting to observe that another moot question in astronomy seems to be resolved by Prof. Ramsay's work. It is known that the dynamical relation of the vapour of water to Mars is nearly the same as that of helium to the earth. We are accordingly now justified in presuming with greater confidence that water cannot remain upon Mars, that accordingly the polar snows of that planet are probably carbon dioxide, and that some of the other appearances which have been observed are due to the shifting of low-lying fogs of this vapour as they travel alternately towards the two poles.

G. JOHNSTONE STONEY.

8, Upper Hornsey Rise, N., May 20.

"Plotosus canius" and the "Snake-stone."

POSSIBLY the following facts may possess interest for some of your readers:—

A good many years ago, when sea-bathing in the Old Straits of Singapore (*i.e.* those separating the island from the Malay Peninsula), I put my foot in a slight muddy hollow in the sandy sea-bed; the moment I did so, I received an agonising stab near the ankle (from some red-hot poisoned blade, it seemed) which drove me in hot haste ashore, where a Malay constable, on hearing what had happened, and on examining the wound, pronounced my assailant to be the "ikan sĕmbĭlang" (sĕmbĭlang fish), *Plotosus canius*, one of the siluroids, I am informed by Mr. Boulenger of the British Museum. The fish is armed with three powerful spines on the head, one projecting perpendicularly from the top, and one projecting horizontally from each side.

The Malay lost no time in running to the barracks near by, whence he shortly returned with a little round charcoal-like stone about the size of a small marble. This he pressed on to the wound, to which it adhered, and remained there by itself, without any continuation of pressure, for a minute or more. Then it fell off, and black blood began to flow, which, after a little, was succeeded by blood of normal colour. The pain, which had been excessively acute, began to diminish soon after this, and in an hour had practically disappeared. The wound gave me no further trouble, but a fortnight afterwards I noticed a hole about the size of a pea where the wound had been.

Another gentleman, who, curiously enough, had suffered in the same way in another part of Singapore the same day, was not so fortunate in his cure, being completely laid up for six weeks.

The black stone applied by the Malay to the wound came, he alleged, from the head of a snake, and claimed, therefore, to be a bezoar stone. It was, no doubt, a snake-stone, probably made of charred bone, and therefore porous in character, which would account for the adhesive and absorptive powers it displayed in my case.

In his "Thanatophidia of India," Sir J. Fayrer (quoted by Yule in "Hobson-Jobson") expresses entire disbelief in the efficacy of these stones as remedies "in the case of the *real bite* of a *deadly* snake," owing to the extreme rapidity with which, in such a case, the venom pervades the system.

However this may be, the late Prof. Faraday, after examination of one of these stones, supplied by Sir Emerson Tennent (quoted by Yule), credits it with certain absorbent powers, and it would seem a pity that the undoubted value of such stones, at all events in minor cases, where they may save a great deal of suffering, should be discredited.

Another remedy, considered of some value by Malays for the stab of *Plotosus canius* is the sap of *Henslowia Lobbiana*, which grows freely on the coasts of the Malay Peninsula.

Among other marine offenders of this class dreaded by Malays are several varieties of the skate or sting-ray, "pari" as they are generically called, and some of the "lĕpu," of which the only dangerous one, I have Mr. Boulenger's authority for saying, is the "lĕpu" proper, viz. *Synancia horrida*. When the skate reaches a large size, he will drag a fisherman's canoe a long way.

Among the Medusæ, one much dreaded is known as "ampai," from its long fringes. The effects, unless a remedy can speedily be found, are painful and trying to a degree, seeming to penetrate the whole frame, as it were, electrically, at once specially affecting the seat of any ailment, and even the teeth and the hair. I have never suffered from it myself, but am enabled to speak to these points from two cases which came under my personal observation. A valuable remedy for this sting, if applied soon, is the juice of the young fruit of the papaw (*Carica papaya*).

A further illustration of the value of some native remedies is supplied by a case which occurred some years ago at Malacca, during my residence there, though I cannot state what the remedies employed were.

A young gentlemen in the office of the Telegraph Company went out to bathe in the sea one night from the end of the pier (in any case rather a rash proceeding, if only for the occasional presence of crocodiles!), when he found himself in the embrace of some creature with long tentacles, from which, after desperate struggles, he eventually succeeded in freeing his legs and his arms, and in regaining the pier. The Colonial surgeon could do nothing for him, and he was in such tortures that for a time he seemed to have lost his mental balance, but nine or ten days after the occurrence a native practitioner, being called in, cured him completely.

D. HERVEY.

The Elms, Aldeburgh, May.

Microphotography, Isophotography, Megaphotography.

I HAVE read with much interest your article on microphotography (p. 4) at its best. Possibly some of your photographer readers may be glad to know that microphotography of sorts is within the reach of all who possess a microscope with suitable substage-condenser and a camera. The results may not compete with the best, but they are very useful. I find that any transparent object which can be conveniently seen in the microscope can be reproduced in the camera. If the fine adjustment is good enough for ordinary work, it is good enough for photographic work.

One of my earliest attempts was to photograph fluid inclusions in quartzes with ordinary sunlight, and rock-sections polarised. The only difficulty was that the sun would not keep still, and without a heliostat the work was most troublesome, not to say aggravating. In one case, a mere movement of the condenser-diaphragm made the bubble in the inclusion fly backwards and forwards. A negative was taken in each position, and a lantern slide taken of each negative. With a little device in the double lantern the motion of bubbles in inclusions can be shown on a nine-foot screen. These negatives were taken with a 1/16th immersion, the camera being extended with a brown paper tube, and the extra apparatus did not cost one shilling.

Up to a $\frac{1}{2}$-inch objective, ordinary gas, with isochromatic plates, does very useful work. The only difficulty to surmount is to handle the focusing apparatus, and see the focusing screen at the same time. A hand mirror solves the problem. But a fine adjustment is really scarcely necessary, as it is easy to focus with the camera as in ordinary photography.

It is often desirable to photograph objects their exact size. Before the Kent's Cavern Collection was divided, I photographed the choicest examples for the Torquay Natural History Society. The implements were fixed with beeswax on a piece of plate-glass, which could be placed in any position and backed by any desired background. I sent a couple of prints to the International Amateur Photographic Exhibition at Vienna, and the jury, much to my surprise, awarded them a diploma. The extra apparatus certainly did not cost 10*s.*, and the negatives were taken in the lecture-room of the Natural History Society under some disadvantages.

Of megaphotography I have but a single experience. While observing the transit of Venus, I thought I would try a photograph. I drilled a hole in the telescope cap for diaphragm; took off the eye-piece and stuffed the telescope into a common camera, with a red cloth to make it light-tight; exposed six negatives with hand exposure on instantaneous plates. Result: four passable negatives and one good one. This quite unlooked-for success was due to some back volumes of NATURE which propped up the camera. The success was really a downright "fluke"; for, knowing the exposure must be hundreds of times too much, I added a quantity of bromide of potassium to the developer, and the amount chanced to be correct. All photography is done with objective and camera. In photographing the sun, the object is some ninety millions of miles off; in photographing a fluid inclusion in quartz, it is the 1/16th of an inch off—a mere question of detail. Most of these scientific photographs are far easier than the simplest everyday landscape.

A. R. HUNT.

Comets and Corpuscular Matter.

REFERRING to Prof. J. J. Thomson's article on "corpuscles" in your issue of May 10, it occurs to me that the behaviour of corpuscular matter described therein may have some bearing on cometary phenomena. May not the structure of comets to some extent be explained by assuming that their tails are composed of aggregations of negatively charged particles of extremely minute size, answering to the free corpuscular matter as defined by Prof. Thomson, and which to a large degree may be formed by a sort of "corpuscular dissociation," or detachment, taking place in the comet's nucleus when its temperature is elevated upon nearing the sun? Since Prof. Thomson's experiments indicate the presence of negatively charged matter in kathode rays having a much smaller mass than ordinary atoms, there is reason to believe that matter in this state has properties quite apart from matter in a much coarser state of atomic division. Postulating an electrostatic field as existing in interplanetary space, with the sun as a negative centre or source of electrostatic radiation, and assuming that a comet's tail is composed of these corpuscles, the gravitational force it may suffer, when in proximity to the sun, would perhaps be very small in comparison with the electrostatic force existing throughout the vast congregation of these extremely minute particles, and thereby account for the repulsion of the tails of comets when they approach the sun.

The nuclei of comets may be composed of matter in a much coarser state of subdivision, which, though endowed with positive or opposite electricity, is subject to gravitational influences which determine their course in the neighbourhood of the sun.

While the above is a partial re-statement of existing hypotheses, it may, I venture to suggest, be of interest in connection with Prof. Thomson's remarkable experiments on matter smaller than atoms.

F. H. LORING.

1 Champion Grove, Denmark Hill, S.E., May 18.

A NEW INSTRUMENT TO MEASURE AND RECORD SOUNDS.[1]

A DIRECT, absolute measurement of the intensity of sound at any point in the air must determine in ordinary units, such as kilogram-metres, the energy involved in the condensations and rarefactions of which the propagation of sound consists. But these pulsations follow each other so rapidly, and the amount of energy involved in even the loudest sound is so infinitesimal, that such measurement is attended with considerable difficulty; so much, indeed, that probably not a half-dozen laboratories in the world have any instrument whatever purporting to make direct, absolute measurements of the energy of sound.

We owe to Helmholtz ("Wissenschaftlische Abhandlungen," vol. i. p. 378) a mathematical theory by which we can determine the ratio between the energy of the pulsations of a tone just without, and that within a spherical Helmholtz resonator; to Lord Rayleigh we owe an expression for the energy of sound in terms of the condensation ("Theory of Sound," vol. ii. Sec. 245). Upon these two results this instrument (like Wien's, *Wied. Ann.* 1898, p. 834) is founded.

A pure tone is received into a spherical Helmholtz resonator, a portion of the walls of which is replaced by a small, circular, extremely thin glass plate, situated just opposite the mouth of the resonator. The pulsations within force this plate to vibrate with the tone's frequency; and if the natural pitch of the plate is made to approximate that of the resonator and tone, the amplitude of the plate's vibrations are rapidly multiplied. To make this amplitude a definitely measurable quantity, the sensitive plate carries at its centre a tiny mirror, which forms one of a system of mirrors constituting Michelson's refractometer (*Phil. Mag.* 1882, xiii. p. 236). A displacement of the little mirror from its position at rest amounting to a half wave length of light will cause a corresponding shifting to one side of the interference bands, so that each dark band will take the position before occupied by the next dark band. The width of the bands may be so adjusted that a telescope with micrometer eyepiece can easily subdivide each band into a hundred parts. Hence the displacement of the sensitive plate, while a tone is sounding, could be observed with great precision, if the eye could act with sufficient rapidity to mark the oscillation of any one band.

That, of course, is out of the question. But it is easy to compound this motion of the bands with another motion perpendicular to it (also in the focal plane), and thus to make the displacements visible. To do this, the interference bands are made to stand vertically in the field, and a screen with a narrow, horizontal slit is interposed in the line of sight; consequently the bands during silence appear in the telescope as a narrow, horizontal strip, composed of the bands reduced to

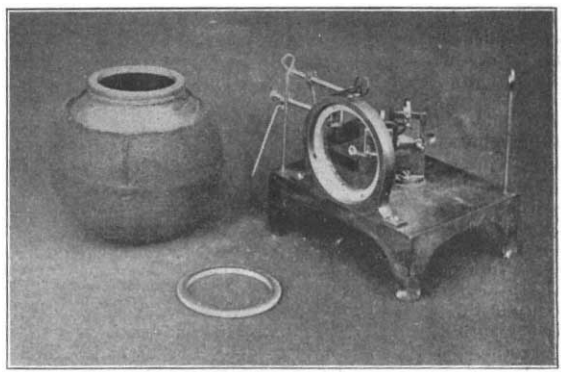

FIG. 1.—The refractometer. The resonator has been unscrewed from the supporting bracket, leaving the sensitive plate and tiny mirror in place.

square spots of dark and light. Now a small lens, forming the object-glass of the telescope, is mounted upon the end of one tine of a tuning fork, electrically driven, and having the pitch of the tune to be measured. During silence, the vertical vibration of the object-glass stretches out the strip of spots into a rectangle of long, vertical bands. But when the tone sounds, these bands arrange themselves diagonally across the same rectangle, the slope of the bands increasing with the intensity of the tone.

The micrometer eyepiece can be rotated on its optical axis, and it is provided with a tangent screw for close adjustment. As it is rotated a vernier moves over a graduated arc, so that the angle of the slope (a) may be measured, as well as the height (Q) of the rectangle, the height (o) of the strip, and the width of five double bands. Putting $B = Q - o$, and P = the displacement of a band, we have $P = B \tan a$. The intensity of the tone is proportional to P^2, which is thus determined in mean wave-lengths of white light.

Thus far it has been tacitly assumed that the source of tone is at just the right distance from the receiving resonator for the vibrations of the sensitive plate to be in phase with those of the fork carrying the object-glass. But in ordinary work this agreement in phase

[1] This instrument is described somewhat more fully than it is here in the *Monthly Weather Review*, July 20, 1899, published by the U.S. Department of Agriculture. We are indebted to the courtesy of its editor, Prof. Cleveland Abbe, for the accompanying illustrations.